

Watershed Hydrology

We tend to take the availability of water for granted. How often do we think about its source, how it flows from the tap above our sink or is pumped from our private or public wells? We're more appreciative in times of drought, but with increasing populations and development, the source and supply of our usable water and conservation of our water resources have become important watershed issues year-round, regardless of precipitation levels.

Almost all of the water that exists today was developed billions of years ago when the earth was formed. The amount of water stays fairly constant because our water supply is continuously being recycled through the earth's natural processes known as the water cycle.

The water cycle depicted in the diagram shows the different stages in the cycle. The sun heats oceans, lakes and rivers, causing the liquid water to evaporate into a gas called water vapor. Plants also release water through their leaves in a process called transpiration.

When the water vapor cools, it condenses to form clouds. Precipitation occurs when water from

the clouds falls to the earth as rain, sleet, hail, or snow. Some water is absorbed directly by plant roots. Other water seeps into spaces underground and becomes **ground water**. The water that seeps underground replenishes the **aquifers**. Waters the ground cannot absorb due to saturation or heavy precipitation events ends up as runoff. All water eventually reaches streams and rivers which flow to the oceans where the water cycle begins all over again – every day – all around the world.

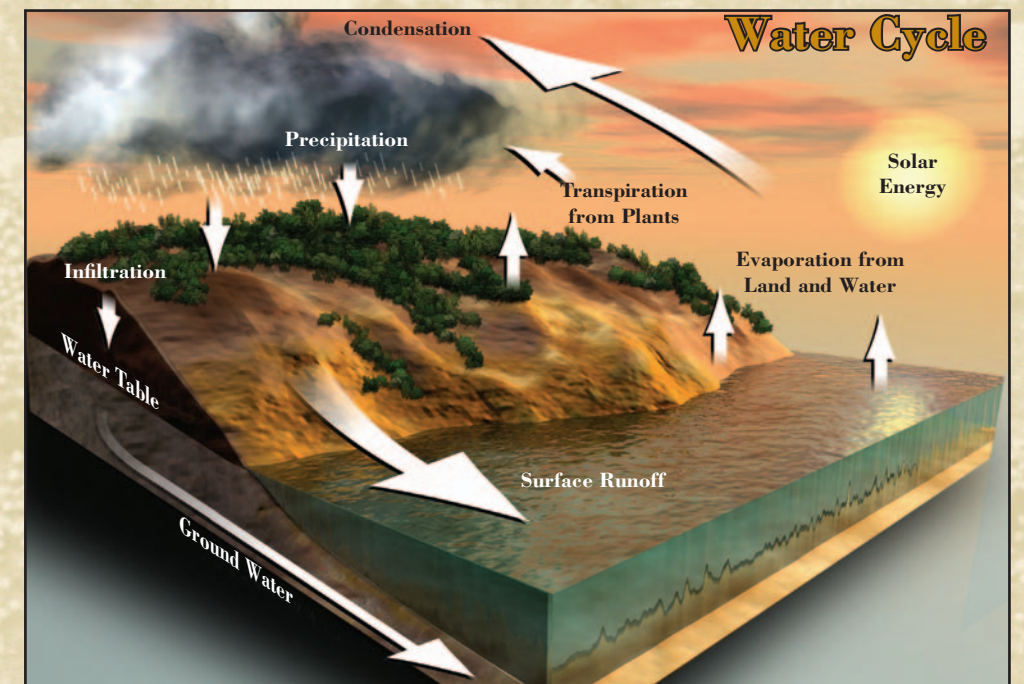
Water is stored in underground “reservoirs” called aquifers. Aquifers are porous sections of rock and soil that can supply significant amounts of water. There are 14 major aquifers in Delaware; thirteen are in the Delaware Bay and Estuary Basin. The water availability and depth of these aquifers differ throughout the basin.

Each day in the Delaware Bay and Estuary Basin, Delawareans use over 62 million gallons of fresh water for drinking, industrial, and agricultural purposes. Almost this entire amount is obtained from wells pumping ground water stored in the aquifers.

For example, in the accompanying cross-section

tion, or vertical slice of the earth through this basin, you can see that the towns of New Castle and Delaware City have wells that obtain water from an aquifer known as the Potomac Formation. Moving further to the south, the city of Dover's main water sources are from the **water-table** aquifer called the Columbia Formation and deeper water-bearing units called the Piney Point and the Cheswold aquifers. In the southern part of the basin, the town of Milford derives its water from the Columbia Formation and the Milford and Frederica aquifers.

Ground water is the sole source of drinking water in this basin. Ground water is available from both the unconfined, or water-table aquifer and several deeper, confined aquifers. Throughout much of the basin, however, the unconfined aquifer is connected with the underlying confined aquifers, as the sediments that separate them have been eroded away by the meandering course of the Delaware River, which acts as a reservoir for surface-water runoff



Human activities can have a significant impact on the water cycle. When forests and other vegetation are removed and roads and buildings constructed, less precipitation can infiltrate the soil, and runoff increases.

and **ground-water discharge** within the basin.

Despite the seemingly plentiful supply in deep aquifers, water is not an infinite resource. During the past decade, several serious droughts in Delaware – the most recent in 2002 that pushed stream levels in northern New Castle County to record lows – have served to illustrate this lesson for many residents.

Representative Geological Cross Section of the Delaware Bay and Estuary Basin

